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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,822	02/06/2004	Lotfi Hedhli	IR 3699 NP	7965

31684 7590 09/13/2005

ARKEMA INC.
PATENT DEPARTMENT - 26TH FLOOR
2000 MARKET STREET
PHILADELPHIA, PA 19103-3222

EXAMINER	
TUROCY, DAVID P	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 09/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/773,822	HEDHLI ET AL.	
	Examiner	Art Unit	
	David Turocy	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *8/15/2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-9 and 11-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-9 and 11-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

2. Applicant's arguments, filed 8/15/2005, with respect to the rejection(s) of claim(s), with respect to the references failing to teach of a carrier gas, under 35 USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of US Patent 6077621 by Allen et al and Kirk-Othmer.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claim 1, 4-5 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6159533 by Dearnaley et al ("Dearnaley") in view of US Patent 6077621 by Allen et al. ("Allen") and further in view of Kirk-Othmer and WO01/32949 by Förnsel et al ("Förnsel").

*** Please note US Patent 6800336 is used as a literal translation of WO 01/32949***

Claims 1, 3-5, and 11-13: Dearnaley discloses a method for depositing a catalyst on a fuel cell electrode for use in a membrane electrode assembly under high vacuum vaporization (abstract). Dearnaley discloses using a fuel cell electrode comprising a carbon cloth and membranes including carbon particles (Column 2, lines 29-39). Dearnaley discloses known polymer electrolyte membranes utilized in fuel cells including NAFION (Column 3, lines 30-34). Dearnaley discloses the preferred catalyst is platinum (Column 2, line 56). Dearnaley fails to disclose chemical vapor deposition at atmospheric pressure.

However, Allen discloses chemical vapor deposition (CVD) is a known substitute in the art for high vacuum vaporization to deposit metal films on polymer substrates (Column 2, lines 33-35). Allen discloses CVD normally occurs at atmospheric pressure and the constituents are often diluted using an inert carrier gas, but discloses CVD often operate at high temperatures for a polymer film (Column 2, line 58-Column 3 line 6).

Substitution of equivalents requires no express motivation. *In re Fount*, 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152, USPQ (CCPA 1967).

Dearnaley in view of Allen teaches of atmospheric CVD deposition of metal films on polymer membranes and discloses CVD deposition is constrained by the high temperature, but fails to disclose plasma deposition. However, Kirk-Othmer, teaching of known chemical vapor deposition techniques, discloses plasma enhanced chemical vapor deposition (PECVD) enhances decomposition and reaction during coat formation (Page 1). Kirk-Othmer also discloses PECVD is utilizes to give activation and partial reaction of the vapors so the substrate temperature can be reduced and still obtain similar quality films (Page 5). Kirk-Othmer discloses using plasma allows for equivalent film to be deposited at several hundred degrees lower then that of a typical CVD (Page 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Dearnaley in view of Allen to plasma enhance the chemical vapor deposition as suggested by Kirk-Othmer to provide a desirable metal coating on a polymer substrate because Dearnaley in view of Allen discloses CVD deposition on polymer substrates is hindered by high temperatures and Kirk-Othmer discloses PECVD is known in the art to provide deposition of high quality films at low temperatures and therefore would reasonably be expected to effectively provide metal films on a polymer substrate. It is well settled that the significance of evidence that a problem was known in the prior art is that knowledge of a problem provides a reason or

motivation for workers in the art to apply their skill to its solution. *In re Nomiya*, 509 F.2d 566, 574, 184 USPQ 607, 613 (CCPA 1975).

While Dearnaley in view of Allen and further in view of Kirk-Othmer discloses an PECVD consists of an electrical discharge, they fail to disclose atmospheric plasma CVD by passing the reactants and the carrier gas through the electrical discharge (Page 1689, Column 2, last paragraph).

However, Förnsel, teaching a known method of plasma coating surfaces at atmospheric pressure, discloses passing reactants and the carrier gas through an electrical discharge at atmospheric pressure (abstract, column 4, lines 38-40). Förnsel discloses passing the reactants though a nozzle containing coaxially arranged electrodes (Column 3, lines 1-2). Förnsel discloses that for coating large surfaces, attach one or more nozzles eccentrically over a rotating nozzle that scans the nozzles over the membrane (Column 3, lines 6-10). While the examiner notes Förnsel discloses polymerization coatings, Förnsel also suggests to one of ordinary skill in the art a method of atmospheric plasma coatings where any precursor material is reacted, by plasma, to form a coating.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Allen and further in view of Kirk-Othmer to use the atmospheric pressure plasma jet as suggested by Förnsel to provide a desirable catalyst coating on a fuel cell electrode with the reasonable expectation of success because Dearnaley in view of Allen and further in view of Kirk-Othmer teach of plasma spraying of metal on a polymer substrate and Förnsel teaches of a known atmospheric

pressure plasma jet for coating surfaces that passes the reactants and a carrier gas through an electrical discharge.

Dearnaley in view of Allen and further in view of Kirk-Othmer and Förnsel fails to explicitly state using a carrier gas without adding a noble gas. Förnsel discloses using an inert gas as the carrier gas and discloses nitrogen as the carrier gas to prevent oxidation of the reactants of the precursor material (Column 5, lines 11-13).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to select any inert carrier gas, including nitrogen, because Förnsel teaches of using nitrogen as the carrier gas to prevent oxidation of the reactants with the reasonable expectation of success.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dearnaley in view of Allen, Kirk-Othmer and Förnsel and further in view of Schütze et al ("Schütze").

Dearnaley in view of Allen, Kirk-Othmer and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, including providing an electrical discharge by coaxially-arranged electrodes, but the references fails to teach of parallel electrodes.

However, Schütze, teaching of an atmospheric plasma jet, discloses known and suitable methods for producing an electrical discharge include parallel electrode plates and coaxially arranged electrodes (Page 1690 Paragraph bridging column 1 and 2, Page 1689 Column 1 Last Paragraph). Therefore Schütze discloses parallel plate

electrodes are equivalent to coaxially arranged electrodes for providing an electrical discharge during atmospheric plasma generation. Substitution of equivalents requires no express motivation. *In re Fount*, 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152, USPQ (CCPA 1967).

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dearnaley in view of Allen, Kirk-Othmer and Förnsel and further in view of US patent 6074692 by Hulett ("Hulett").

Dearnaley in view of Allen, Kirk-Othmer and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above and Dearnaley discloses using plasma spray techniques such as chemical vapor deposition allow for deposition of materials over large areas through a reel-to-reel or web coating process, but they fail to explicitly teach of advancing the membrane beneath the nozzle (Column 2, Lines 12-19).

However, Hulett, teaching a method of making a PEM fuel cell, discloses applying a catalyst onto both faces of the strip by spraying as it passes underneath the nozzles (Column 5, lines 17-25, Figure 1).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Allen, Kirk-Othmer and Förnsel to use the traversing membrane suggested by Hulett to provide a desirable PEM fuel cell with the reasonable expectation of success because Dearnaley in view of Allen, Kirk-Othmer and Förnsel teaches thermal spraying techniques provide for web coating processes

and Hulett teaches a PEM web coating process includes advancing the membrane beneath the nozzle.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dearnaley in view of Allen, Kirk-Othmer and Förnsel further in view of US Patent Publication 2003/0096154 by Yasumoto et al ("Yasumoto").

Dearnaley in view of Allen, Kirk-Othmer and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach spraying the catalyst on the surface of the polymer electrolyte membrane.

However, Yasumoto, teaching of a method for spraying a catalyst with a carrier gas, teaches of spraying the catalyst directly onto the surface of the polymer electrolyte film or onto a porous conductive electrode substrate (Paragraph 0014). Yasumoto also discloses by spraying directly onto the film, the catalysts particles become embedded in the film and therefore the cell performance is improved (Paragraph 0016).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Allen, Kirk-Othmer and Förnsel to apply the catalyst directly onto the surface of the polymer electrolyte membrane as suggested by Yasumoto to provide a desirable catalyst layer on a electrolyte membrane with the reasonable expectation of success because Dearnaley in view of Allen, Kirk-Othmer and Förnsel teaches spraying a catalyst on a porous electrode film and Yasumoto teaches that spraying the catalyst directly onto the polymer electrolyte membrane increase the cells performance over a catalyst sprayed on a porous electrode film.

9. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dearnaley in view of Allen, Kirk-Othmer, Förnsel and Yasumoto and further in view of US Patent Publication 2004/0180250 by Nanaumi et al ("Nanaumi").

Dearnaley in view of Allen, Kirk-Othmer, Förnsel and Yasumoto teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach spraying the catalyst on the surface of the polymer electrolyte membrane comprising a acrylic based polyelectrolyte/fluoropolymer blend or a polyhydrocarbon-based sulfonic acid.

However, Nanaumi, polymer electrolyte membrane structures that provide inexpensive electrode structure and have excellent power generation efficiency, discloses using a hydrocarbon-based sulfonic acid (Paragraph 0007, 0010). Nanaumi teaches that such electrolyte polymer membranes comprise copolymers of an acrylic based polymer and a fluoropolymer (Paragraph 0012-0015).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Allen, Kirk-Othmer, Förnsel and Yasumoto to use the polymer electrolyte membrane structure suggested by Nanaumi to provide a desirable catalyst on a membrane with the reasonable expectation of success because Dearnaley in view of Allen, Kirk-Othmer, Förnsel and Yasumoto teaches spraying catalyst onto a polymer electrolyte membrane and Nanaumi teaches of known polymer electrolyte membrane structures that are inexpensive and have excellent power efficiency.

10. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dearnaley in view of Allen, Kirk-Othmer and Förnsel and further in view of US Patent Publication 2003/0059659 by Kamo et al ("Kamo").

Claims 14 and 15: Dearnaley in view of Allen, Kirk-Othmer and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach of a catalyst layer including a platinum alloy or a binary and ternary platinum alloy using metals from column 4-11 of the periodic table.

However, Kamo, teaching of fuel cell equipment using an electrolyte membrane, discloses while the cathode catalysts is known to be fine platinum particles, the anode side comprise fine particles of platinum and ruthenium or platinum/ruthenium alloys (paragraph 0066). In addition Kamo discloses it is advantageous to combine the noble metal components with a third component selected from iron, tin, rare earth elements, etc. to stabilize and extend the life of the electrode (Paragraph 0067).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Allen, Kirk-Othmer and Förnsel to use the platinum/ruthenium alloy as suggested by Kamo to provide a desirable catalyst layer on a electrolyte membrane with the reasonable expectation of success because Dearnaley in view of Allen, Kirk-Othmer and Förnsel teaches an polymer electrolyte membrane with a platinum catalyst layer and Kamo teaches that platinum/ruthenium alloy is a known substitute for platinum and ruthenium particles for an anode catalyst and additional elements increase the catalyst stability and life span.

11. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dearnaley in view of Allen, Kirk-Othmer and Förnsel and further in view of Haug et al ("Haug").

Dearnaley in view of Allen, Kirk-Othmer and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach of depositing multiple catalyst layers.

However, Haug, teaching of increasing the PEM catalyst effectiveness, discloses using a multilayer electrode technique increases the regions of active platinum by increasing the number of platinum layers deposited (Pg A284, Column 2 last paragraph). In addition, Haug discloses that Membrane electrode assemblies with multiple layers of platinum outperform those with only a single layer (Page A285, Column 1, First Paragraph).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Allen, Kirk-Othmer and Förnsel to use the multiple platinum layers as suggested by Haug to provide a desirable catalyst layer on a electrolyte membrane with the reasonable expectation of success because Dearnaley in view of Allen, Kirk-Othmer and Förnsel teaches an polymer electrolyte membrane with a platinum catalyst layer and Kamo teaches that multiple platinum layers increases the region of active platinum over a single platinum layer.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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AU 1762

TIMOTHY MEEKS
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